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DYNAMAC CORPORATION
Environmental Services

Peachtree Center Tower
230 Peachtree Street, N W
Suite 500
Atlanta, GA 30303

Telephone 404-681-0933
Fax 404-681-0894

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March 16, 1993

Ms. Cheryl Smith
U.S. EPA Region IV
North Superfund Remedial Branch
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Re: Work Assignment No. C04054 - Olin Corporation Site, McIntosh, Alabama - Technical Review and Comments Report on the Draft Remedial Investigation Report
Document Control No. C04054-OC-TR-004

Dear Ms. Smith:

In partial fulfillment of Work Assignment No. C04054, Dynamac Corporation is pleased to submit two copies of the Technical Review and Comments Report prepared by PRC Environmental Management, Inc., on the Draft Remedial Investigation Report for the Olin Corporation Site, McIntosh, Alabama. A copy of the Report is also enclosed on a 3.5" diskette in WordPerfect 5.1 format.

If you have any questions or comments, please contact Bob Martin or me at (404) 681-0933.

Sincerely,

DYNAMAC CORPORATION

David L. Rusher
Regional Manager

DLR/mcc

Enclosure

cc: Ken Meyer, EPA Region IV Project Officer
Dennis Escher, Dynamac TES Program Manager
Robert L. Martin, Dynamac Work Assignment Manager
TES WA File

TECHNICAL REVIEW COMMENTS
DRAFT REMEDIAL INVESTIGATION REPORT
OLIN CORPORATION, McINTOSH, ALABAMA
PREPARED BY WOODWARD-CLYDE CONSULTANTS, INC.
MARCH 1993

PRC Environmental Management, Inc. (PRC), under U.S. Environmental Protection Agency (EPA) Contract No. 68-W9-0005, performed a technical review of the Draft Remedial Investigation (RI) Report for the Olin Corporation (Olin) site, McIntosh, Alabama. Woodward-Clyde Consultants, Inc. prepared the Draft RI Report for Olin Corporation. The Draft RI Report includes: (1) a comprehensive description of all site characterization activities and results, (2) interpretations regarding potential contaminant sources and the nature and extent of contamination, (3) a discussion on the fate and potential transport mechanisms of site contaminants, and (4) a comprehensive baseline risk assessment. Olin has submitted this Draft RI Report to EPA for review. Olin will incorporate EPA's review comments into the Final RI Report, and will perform corrective actions pursuant to the Administrative Order on Consent (AOC), EPA docket number 90-13-C.

PRC reviewed this Draft RI Report according to (1) the requirements set forth in the AOC; (2) the objectives and methodologies outlined in the Remedial Investigation and Feasibility Study (RI/FS) Project Plan, May 1991; (3) additional sampling objectives presented in the Phase III Sampling and Analysis Plan (SAP), June 1992; (4) EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004, October 1988); and (4) EPA's Standard Operating Procedures and Quality Assurance Manual (SOPQAM), February 1991. All references cited in the text are listed at the end of this document.

After reviewing the Draft RI Report, PRC has determined that the report adequately presents site data collected to date. However, PRC found technical deficiencies in the report that will require modifications or explanations by Olin. PRC's comments regarding the Draft RI Report are presented below. The technical review comments are divided into two parts. The first part presents comments regarding Sections 1.0 through 5.0, and 7.0 of the Draft RI report. The second part presents comments on Section 6.0, which pertains to the Baseline Risk Assessment portion of the Draft RI report.

TECHNICAL REVIEW COMMENTS - SECTIONS 1.0 - 5.0, and 7.0

GENERAL COMMENTS

1. The document contains minor grammatical and typographical errors that should be corrected.

2. The report should include a discussion of the quality assurance/quality control (QA/QC) procedures implemented during field sampling activities. Information discussed should include the type of QA/QC samples collected, such as field blanks, duplicates, and equipment rinsates, as well as the frequency of sample collection.

3. The report lacks any discussion of the results of EPA-provided blank and spike analyses, or the fact that EPA collected split samples during all sampling activities. This information should be reported in the document.

4. To provide an adequate discussion of the field activities that occurred during the remedial investigation, the document should include a discussion of the level of personal protection used by field workers, specifically that Level B protection was required for drilling and sample collection in the Old Plant (CPC) landfill area.

5. Physical mechanisms such as filtration, dispersion, and dilution are not addressed in Section 5.0. In general, physical mechanisms have a lower attenuation potential, although they can be important in support of physio chemical (adsorption and fixation) and chemical (precipitation, oxidation/reduction, and complexation) mechanisms. For example, dispersion can increase the effectiveness of adsorption because "spreading" of the migrating zone exposes the pollutants to a greater number of soil particles. In addition, dispersion can increase the potential for biological reactions that rely upon exposure to nutrients, bacteria and/or oxygen. Furthermore, filtration is a factor in chemical precipitation because the soil pores can stop or retard migration of the precipitates, although most chemical precipitation occurs on the surfaces of existing soil minerals. Filtration may be a primary attenuation mechanism for mercury, chromium (III) and beryllium. A discussion of these physical mechanisms in relation to the fate and transport of site contaminants should be provided.

6. Biodegradation as a biological mechanism is addressed for organics; however, other biological mechanisms, such as cellular uptake by plants, are not discussed in Section 5.0. Cellular uptake is the process by which the concentration of metal cations and major anions can be attenuated in near-surface soils by absorption into certain types of plants. A discussion of biological absorption mechanisms in relation to site contamants should be provided.

7. The nature and importance of vadose zone properties relative to attenuation are not discussed in Section 5.0. The important zone properties that should be discussed include soil physical properties (organic content, clay, silt, sand, and gravel), soil/pore water chemistry (pH, Eh, cations exchange capacity) and pore water volume.

   Soil type and attenuation are directly related. For example, sandy soil may be less effective for attenuation for metal cations than fine-grained silt or clay. High organic matter content will increase the potential for the attenuation of several metals. However, soils containing a large amount of organic matter may tend to be acidic, due to the formation of organic acids by biodegradation. This may reduce the attenuation of metals. Furthermore, the potential for attenuation often will be enhanced if the pore water volume is below field capacity, because this condition will slow the migration rate and will promote dispersion in the vadose zone. Soil properties are important in evaluating the migration potential of site contaminants.

SPECIFIC COMMENTS

1. Section 1.2.1.2, Page 1-13, Paragraph 2. The text in this section identifies that the sanitary landfills were used for the disposal of general nonhazardous waste and plant refuse from 1977 to 1984. The text should indicate where general plant refuse was disposed of from 1952 to 1977.

2. Section 2.0, Page 2-1, Paragraph 2. Reference to Section 6.8 should be corrected to Section 6.9 in the last sentence of the paragraph.

3. Section 2.1.5.2, Page 2-19, Paragraph 1. From information presented in Section 4.1.1.2, the clay aquitard encountered in Old Plant (CPC) landfill borings has lost its attenuation as a result of the former acid neutralization process that occurred in the area prior to 1972.

Therefore, the word "aquitard", used in the second sentence of this paragraph, should be deleted from the sentence and the word "clay" should be changed to "clays".

4. Section 2.2.3.1, Page 2-28, Paragraph 5. The Preliminary Site Characterization Summary (Woodward-Clyde, 1992a) indicated that Phase I Operable Unit 2 (OU-2) sediment samples were analyzed for chlorinated benzene compounds using a laboratory screening method. Also, Appendix F presents the results of the laboratory screening analysis. The text has identified the analyses performed under the Contract Laboratory Program (CLP) but has omitted mention of the screening analysis. Mention of the screening method and the rationale for using this method should be included in this section.

5. Section 2.2.3.3, Page 2-32, Paragraph 2. The text indicates that Phase III sediment samples were collected from the ponded area north of the basin; however, Figure 2-4 and field observations by the EPA oversight contractor indicated that sampling occurred in both of the ponds north of the basin. This correction should be made.

6. Section 2.2.3.3, Page 2-32, Paragraph 3. According to information obtained from the EPA oversight contractor, the process of clearing vegetation around the sampling area or of backfilling the sample hole with native soils when samples were collected from submerged areas was not feasible. This information should be included in the text.

7. Section 2.2.3.3, Page 2-32, Paragraphs 3 and 4. The text should be written to more accurately describe the condition of the flood plain at the time the samples were collected. The methodology used in the collection of samples should also be described in more detail. According to information obtained from the EPA oversight contractor, the flood plain was in a modified flood condition during Phase III sediment sampling activities, and most sampling areas were submerged. Also, the description of the methodology used for sampling should indicate that some samples collected in submerged areas were collected using hand sampling tools, such as a hand auger, and that not all sediment samples collected from the boat were collected using the Eckman dredge.

8. Section 2.0, Table 2-3. According to the EPA Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual (SOPQAM), polyvinylchloride (PVC) well screens and casings are not acceptable for monitoring organic compounds because of their sorptive and leaching properties. As stated in Footnote 1 of this table, all wells are

constructed of PVC materials with the exception of process wells WW8 and WW12. The potential for the leaching of the PVC by organic constituents in the groundwater should be considered in evaluating the groundwater sampling data.

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Also, well construction details for monitoring well PL-10D have been omitted from this table.

9. Section 2.0, Figure 2-1. Monitoring well WP-6A is indicated on this figure; however, the corresponding text refers to WP-6. If one well is being referred to in both the figure and the text, then one consistent number should be designated for that well.

10. Section 3.3.2, Page 3-8, Paragraph 2. It should be stated in the text whether or not the sheet pile weir is effective in preventing plant wastewater from entering the basin during flood conditions.

11. Section 3.0, Figure 3-10. Because the purpose of this map is to present the direction of groundwater flow prior to the implementation of the corrective action program, corrective action wells CA-1, CA-2, CA-3, CA-4, and CA-5 should be deleted from the figure.

12. Section 4.1.1.1, Page 4-4, Paragraph 3. The text should fully explain the basis for determining that the weak brine pond is the most likely source of mercury contamination to the groundwater, since no soil sampling was conducted for this source during Phase III sampling activities.

13. Section 4.1.1.2, Page 4-14, Paragraph 3. The text states that boiler ash may be one possible source of polynuclear aromatic (PNA) compounds detected in subsurface soil samples collected from the sanitary landfills. To support this assumption, a hazardous constituent analysis of the boiler ash should be provided by Olin and should be included in the document.

14. Section 4.1.1.2, Page 4-16, Paragraph 2. Although it has been stated that the mercury cell plant is probably not a continuing source of mercury contamination to groundwater, the text should include a statement indicating that mercury contamination in the area occurred either during regular operations or as a result of mercury cell plant

decommissioning procedures. This would indicate the approximate amount of time that mercury has been present in soils.

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Also, because the concrete pad beneath the asphalt in the former mercury cell plant was the former plant floor, mercury contamination may be present there. The possiblity exists for mercury present in the concrete pad to migrate to the underlying soils and groundwater by molecular diffusion or through cracks in the concrete. In addition, historical information concerning the operations in the area and the unknown concentrations in the underlying soils indicates that the mercury cell plant should not be ruled out as a possible source of mercury contamination to groundwater.

15. Section 4.1.2.5, Page 4-42, Paragraph 3. Monitoring well BA-1, as well as the horizontal extent of mercury contamination at the eastern site boundary is not depicted on Figure 4-5 as referenced in the text. These should be depicted on Figure 4-5. Also, because mercury was detected at low levels in well BA-1, the full extent of mercury contamination to the east has not been defined.

16. Section 4.1.3, Page 4-46, Paragraph 2. From information provided in the text, it appears that corrective action well CA-1 is not equipped for mercury removal. It should be explained in the text why recovered mercury is treated in well CA-2 and not in well CA-1.

17. Section 4.1.3, Page 4-49. No information on the effectiveness of the corrective action system in controlling plume migration to the west and southwest has been included this section. Also, this section should include discussion of the potential need for remediation of the Miocene Aquifer.

18. Section 4.1.3, Page 4-49, Bullet 1. The text states that the corrective action well system is effective at controlling contaminant migration from any known past or present sources. However, based on the configuration of the potentiometric surface maps presented as Figures 3-11 and 3-12, the effectiveness of the system at controlling offsite contaminant migration from the two sanitary landfills can not be considered adequate. The upper zone potentiometric map (Figure 3-11) indicates that groundwater flow from the sanitary landfills is primarily towards the wetlands to the east and not towards the corrective action system. The lower zone potentiometric map (Figure 3-12) indicates that the corrective

action system has only a partial influence on controlling contaminant migration from the sanitary landfills. Therefore, to fully control groundwater flow in the vicinity of the sanitary landfills, either the pumping rates of the corrective action wells should be increased or an additional corrective action well should be installed near the landfills to control movement of the groundwater from this source to the wetlands to the east.

19. Section 4.1.3, Pages 4-49 and 4-50, Bullet 5. The text states that a dense, mercury-containing brine present at the base of the Alluvial Aquifer constitutes a secondary source of mercury in the area of the weak brine pond. Also, the text states that there are no apparent increasing or decreasing trends in mercury contamination from wells screened in the lower zone of the Alluvial Aquifer adjacent to the weak brine pond. The extent of contamination caused by this secondary source should be evaluated and the effectiveness of the present corrective action that is being implemented to remediate the secondary mercury source should be determined.

20. Section 4.2.2.2, Page 4-65, Paragraphs 1 and 2. The first sentence of Paragraph 1 states that two DDE isomers were identified; however, three isomers are listed. Please resolve this discrepancy. Also, the word "peta-chlorinated" in the second sentence of Paragraph 2 should be corrected to "penta-chlorinated".

21. Section 4.2.2.3, Page 4-66, Paragraph 4. According to the EPA oversight contractor, Phase III sediment sampling was conducted in modified flood conditions; however, the text states that sampling was conducted during nonflood conditions. The text should be corrected to reflect the actual site conditions at the time of sampling. Also, the statement that mercury concentrations above 1.0 mg/kg were detected "in the water bodies or in the vicinity of water bodies" is not specific enough, since the entire area is surrounded by water bodies.

22. Section 4.2.2.3, Page 4-67, Paragraph 1. The text should explain how a review of sampling patterns in the vicinity of sampling location FP30 leads to the conclusion that the extent of mercury contamination is limited to the area just east of FP30.

The statements defining the southern extent of contamination in OU-2 during Phase III sampling are contradictory. The limit of contamination to the south cannot be defined,

because one of the three samples collected along the southern-most grid line was contaminated while the other two were not.

23. Section 4.2.4, Page 4-73, Paragraph 2. The text states that "monitor well PE5 was sampled 13 times from 1981 to 1987 for mercury, and that mercury was not detected seven of these times. The concentrations in the remaining five samples ranged from 0.1 μg/L to 1.0 μg/L." The text should be corrected to state that mercury was detected in six of the 13 sampling events instead of five.

24. Section 4.0, Tables 4-6 and 4-7. These tables should differentiate between the samples that were collected with acrylic bailers and those that were collected with teflon bailers to evaluate possible correlations between contaminant concentrations and sampling equipment used.

25. Section 5.1.1.2, Page 5-4, Paragraph 3. The first sentence states, "the potential for air transport of contaminants in OU-1 is limited to the closure and removal activities that were conducted at the site." A brief description of the closure and removal activities that were conducted at the site should be included.

26. Section 5.1.1.3, Pages 5-4 and 5-5, Paragraph 1. This paragraph states that "percolation of rainwater or surface water runoff through contaminated soils or landfilled material could transport the constituents to the shallow groundwater of the Alluvial Aquifer." Data should be provided to support the statement that surface water is considered a transport pathway to the Alluvial Aquifer.

27. Section 5.1.1.3, Page 5-5, Paragraph 2. This paragraph references Section 4.0 for potential vertical migration of constituents through the soil to the Alluvial Aquifer from various sources. Some of the listed sources in this paragraph are not found in Section 4.0. Examples include the lime ponds and strong brine pond as sources of mercury. However, the pH pond, which is considered a potential source area of mercury in the groundwater is not listed in this paragraph. These discrepancies should be resolved.

28. Section 5.1.1.3, Page 5-7, Paragraph 4. As previously described in Section 3.5.1, the Miocene confining unit is composed of clays, sandy clays or clayey sands. The unit is very complex, and is predominantly clay with various amounts of discontinuous sand, silt, or

fine gravel. The text states further that the most plausible mechanism for the transport of consitutents from the Alluvial Aquifer to the Miocene Aquifer is through the annular space around Miocene production well casings. Even though the vertical hydraulic conductivity of the confining unit (K_v) is low, discontinuities in the confining unit may provide a channel for contaminants to move from the Alluvial Aquifer to the Miocene Aquifer. The concentrations detected in Miocene Aquifer wells (DH1, DH2, DH3, WW8, and WW12) are too high to have been introduced from production well casings only. In addition, Miocene wells DH1, DH2, and DH3 are not located near the production wells. Another explanation for the presence of organics in the Miocene Aquifer should be provided.

29. Section 5.1.2.1, Page 5-11, Paragraph 4. The word "atomic" should appear before "number" to indicate the specific number the author is referring to.

30. Section 5.1.2.2, Page 5-17, Paragraph 1. The text states that "a discussion of the general mobility and persistence in the subsurface soil/groundwater media is presented for these constituents in the following paragraphs." However, the discussion is focused only on groundwater. A discussion of the mobility and persistence of constituents in the subsurface soil should be included.

31. Section 7.1.3, Page 7-5, Paragraph 4. The text should include the Old Plant (CPC) landfill as a probable source of mercury contamination for the following reasons: (1) mercury was detected in soil boring 4 at significant concentrations (406 mg/kg), and (2) monitoring wells MP-14, and MP-15, located directly south of the landfill, indicated two of the three highest mercury concentrations detected in groundwater from the lower zone of the Alluvial Aquifer (128 and 146 μg/L, respectively).

32. Appendix B, Section 3.3. It should be clearly stated that information pertaining to the depth, diameter, and construction details of domestic wells was obtained solely from the well owner; no actual measurements or inspections were conducted during the domestic well survey.

33. Appendix B, Section 3.4. A survey was conducted to determine the frequency and amount of fish consumed from the Olin basin by certain area residents within a 3-mile radius of the site. It is unclear why the fish survey was not also conducted for those households for

which a water well survey was conducted. Also, the text should state whether or not the surveys were conducted simultaneously and when the surveys were conducted.

34. Appendix B, Tables 3.3.2.2 and 3.3.3.3. Although these tables present the required information, they are difficult to follow due to the extensive use of numerical codes. It is suggested that these tables be presented using the actual data. This would relieve the reader of having to determine the meaning of each code.

35. Appendix F. The validated detection limits are not provided for the organic analyses, but are provided for the inorganic analyses. Please explain this inconsistency.

TECHNICAL REVIEW COMMENTS - SECTION 6.0: BASELINE RISK ASSESSMENT

GENERAL COMMENTS

1. The risk assessment needs to be re-evaluated primarily in regard to the exposure assessment. Many of the risk assessment factors evaluated are either unconservative or unrealistic. Also, an on-site residential scenario should be evaluated to provide more information to risk managers and other decision makers. Worker exposure at OU-2 should also be evaluated as a future scenario. Because the dermal absorption factors and matrix effect factors used to evaluate dermal exposure are similar, it is recommended that the dermal absorption factors be used instead of the matrix effect factors.

2. Considerable time and effort was spent conducting qualitative and quantitative sampling of the vegetative community in OU-2. Although the qualitative data procurred is useful for site characterization purposes, the quantitative data obtained appears to be unuseful in determining the potential impact of contaminants of concern to site vegetation. Additionally, the site conceptual model presented does not indicate vegetation as a potential receptor and ecotoxicity effects on vegetation are not discussed, with the exception of Appendix L. However, the information in Appendix L concludes that there is insufficient literature available concerning the possible effects of mercury on vegetation. A greater effort should have been made to determine the expected impacts of site contamination to both the vegetative and benthic communities to justify the overall conclusion, as stated in Section 7.2.2, Page 7-9, that the effects to the overall ecological

community are minimal. Additional information concerning mercury uptake by plants can be found in "Trace Elements in Soils and Plants", by Alina Kabata-Pendias, CRC Press, 1992.

3. The results of benthic sampling suggest that site contaminants may be a contributing factor to the apparent abnormalities in the benthic community structure. These results also suggest that site contaminants may be a factor in the incidence of aberrant chaetae in basin oligochaetes. However, no recommendations for further study of this or related communities (i.e. food chain receptors) is presented. The text should address this matter.

4. The selection of measurement and assessment endpoints is an important step in an ecological assessment. Well selected endpoints will be those that not only have the ability to show the impact of contaminants of concern, but will exclude many variables and uncertainties from the final risk characterization results.

   The text states that not enough information is available to determine direct impacts of mercury to vegetation, and adequate information concerning the direct or measurable effects of mercury and hexachlorobenzene (HCB) in the benthic community is not presented. It appears that the endpoints selected for this study, density and diversity of the vegetative and benthic communities, are insufficent for assessing the impacts of site contaminants. Additional information should be provided to better correlate the toxicity effects of mercury and HCB on the vegetative and benthic communities.

5. Though the study attempted to statistically analyze the significance of mercury effects on benthic communities, it did not statistically analyze HCB or DDT, which occur as site contaminants. In fact, an analysis of the impact of DDT on the benthic community was completely absent from this report. This is a glaring oversight when the known detrimental effects of DDT and its metabolites on the biological system and its known ability/affinity to bioaccumulate in the food chain are considered. Justification should be provided for omitting DDT and HCB from the study.

SPECIFIC COMMENTS

1. Section 6.3.3, Page 6-3, Paragraph 1. This paragraph states that chemicals having no established toxicity values were not addressed in the risk assessment. These chemicals should be discussed qualitatively in Section 6.3.5.

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2. Section 6.4.2.2, Page 6-8, Paragraph 1. The first bullet lists chemicals that were only detected in 1 out of 29 wells sampled. The compound 2,4-dichlorophenol was reported in Table 4-7 as being detected in 3 wells. In addition, 2,4-dichlorophenol is detected above the contract-required quantitation limit. This chemical should be evaluated in the risk assessment.

3. Section 6.5.1, Page 6-11. This section presents the rationale for evaluating each of the pathways and scenarios evaluated in the risk assessment. This section describes the potential for inhalation of volatiles from domestic well water by off-site residents. It is not clear how the exposure point concentrations were determined for this pathway. If used to evaluate this pathway, the EPA box model presented in Appendix K3 does not appear to be appropriate for this evaluation. It is recommended that a volatilization default factor of 0.5 L/m^3 (0.0005 x 1,000 L/m^3) be used to evaluate the risks from inhalation of volatiles during showering (EPA 1991b). In addition, a shower volatilization model may be used.

4. Section 6.5.1.3, Page 6-13, Paragraph 1. This paragraph describes the potential receptor populations that may be exposed to site contaminants. The text states that based on ownership and deed restrictions the potential for any part of the site to become residential does not exist. A residential scenario should still be evaluated to provide an upper-limit risk estimate.

5. Section 6.5.1.3, Page 6-13, Paragraph 1. This paragraph states that the adolescent age group (8-18 years old) has the greatest likelihood of exposure to site contaminants due to trespassing and domestic water use. This is most likely true for the current resident off-site scenario; however, young children (0-6 years old) should be evaluated for the future residential on-site scenario.

6. **Section 6.5.1.3.2, Page 6-14, Paragraph 1.** This section describes the potential risk to occupational receptors. The text states that quantitative exposures to OU-2 sources were not calculated because plant operations do not require workers in that area. At a minimum, this scenario should be evaluated as a future scenario. Activities at the site may change and the risks to workers at OU-2 should be evaluated.

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7. **Section 6.5.3.2.4, Page 6-23, Bullet 1.** The text states that a dermal surface area of 2,000 centimeters squared (cm^2) is used to estimate dermal exposure to sediment and surface water. This value only includes hands and forearms. A dermal surface area of 5,000 cm^2, which includes exposure to feet and lower legs, is a reasonable and conservative assumption and should be used instead (EPA 1991d).

8. **Section 6.5.3.2.4, Page 6-25, Bullet 2.** The text discusses the exposure time for dermal exposures to groundwater. The values presented are 0.0069 hours per day (0.4 minutes per day) for average exposure and 0.01 hours per day (0.6 minutes per day) for reasonable maximum exposure. EPA recommends using values of 15 minutes per day and 10 minutes per day for the average and reasonable maximum exposures, respectively (EPA, 1992b). The pathway for dermal exposure to groundwater while showering should be re-evaluated using these EPA-recommended values.

9. **Section 6.5.3.2.4, Page 6-27, Paragraph 1.** This paragraph describes values used to account for the matrix effect of soils. This factor is already accounted for by the dermal absorption factor. The dermal absorption factor accounts for the matrix effect factor. Therefore, the matrix effect factor should not be used to calculate dermal exposures (EPA, 1992a).

10. **Section 6.5.3.2.5, Page 6-27, Paragraph 1.** This paragraph describes the soil ingestion rates used in the risk assessment. For the future residential scenario, a soil ingestion rate of 200 mg/day should be assumed for children (0-6 years old.)

11. **Section 6.5.3.2.6, Page 6-30, Bullet 2.** The text describes the percentage of fish obtained by area residents from the basin that is used as food. The text states that the fraction ingested (FI) term of 0.125 was derived from two factors: (1) the percentage of time two fisherman spent fishing in the basin in relation to total fishing activity (0.25), and (2) the percentage of time the area is not flooded (0.5). These two terms overlap to a certain

extent and should not be used together. It may be more appropriate to use 0.5 FI as the reasonable maximum exposure FI due to flooding, and 0.25 FI as the average FI due to fishing.

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12. Section 6.5.3.2.7, Page 6-33, Bullets 1 and 2. These two paragraphs discuss inhalation exposure assumptions. The text states that 75 percent of inhaled particles are deposited in the lung and that 62.5 percent of deposited particles are cleared by ciliary action. Although absorption and clearance processes are occuring, the EPA inhalation toxicity factors are generally based on administered doses. Therefore, the above assumptions should be excluded from the exposure calculations.

13. Section 6.6.1, Page 6-34, Paragraph 2. The text discusses threshold assumptions made when performing toxicity assessments. The term "toxicity assessments" should be modified to differentiate the non-carcinogenic assessments from carcinogenic assessments. The use of the term is confusing because it is the same as the title of Section 6.6, which deals with both types of assessments.

14. Section 6.6.1, Page 6-35, Paragraph 4. The text states that reference doses (RfD) and slope factors (SF) were obtained from the Integrated Risk Information System (IRIS) (EPA 1992c) and the Health Effect Assessment Summary Tables (HEAST) (EPA 1992d). The text should also state that priority is given to values from IRIS.

15. Section 6.6.2, Page 6-37, Paragraph 5. This paragraph discusses subchronic RfDs. A rationale should be provided for evaluating subchronic exposures for this risk assessment. It appears that the same exposure factors were used to evaluate chronic and subchronic exposure. If this is correct, the discussion of subchronic RfDs should not be included. In addition, subchronic hazard quotients and indices should be removed from Appendix K. If correct subchronic exposure factors were used, the rationale for evaluating subchronic exposures should be presented.

16. Section 6.6.2, Page 6-38, Paragraph 3. This paragraph discusses the conversion of an administered oral RfD to an absorbed RfD for the dermal exposure evaluation. It is unclear whether dermal absorption factors or oral absorption efficiencies were used for this conversion. Oral absorption efficiencies should be used. If dermal absorption factors were used, the conversion should be redone using the correct values. In addition, the

conversion values that were used in Woodward-Clyde's ASSESS software should be presented.

17. Sections 6.7.2.2 and 6.7.2.3, Pages 6-44 through 6-48. These sections describe the methodology used to calculate risk and hazard indices. The text in these two sections is very wordy and somewhat redundant. In addition, much of the information in these sections is also presented in Section 6.6. This section should present a better summary of the risk calculation process. The risk characterization information presented in Section 6.6 should be removed from Section 6.6, and should be replaced with toxicity information.

18. Section 6.8.1.1, Page 6-50, Paragraph 1. This paragraph discusses uncertainties in regard to the data used for the risk assessment. The text states that the risks from consumption of fish may be overestimated because bass and catfish may have a higher potential for the bioaccumulation of mercury and DDT. The rationale for this statement should be presented. In addition, the text should clearly state whether the higher potential for bioaccumulation is because bass and catfish physiologically bioaccumulate mercury and DDT more efficiently than other species or because bass and catfish are predatory fish. Also, a table showing the percentage of fish species caught should be included.

19. Appendix K, Tables 1 through 6. These tables present the toxicity factors used in the risk assessment. These factors should be reviewed to ensure accuracy. The following toxicity factors are incorrect and should be changed: The chronic oral RfD for arsenic is 3×10^{-4}, selenium is 5×10^{-3}, and zinc is 3×10^{-1}. In addition, the "b" footnote on the chloroform SF in Table 6 should be removed; it pertains only to arsenic.

20. Appendix K1, Tables 1 through 6. This appendix presents human health risk assessment concentration-toxicity screening tables. Contaminants of concern were identified as chemicals that contributed greater than one percent of the total risk for each medium. This screening has the potential to eliminate chemicals from the risk assessment that may have a carcinogenic risk of greater than 1×10^{-6} or a hazard quotient of greater than 1. A chemical having a high concentration-toxicity value may make the other chemicals appear insignificant. The following table presents contaminants from various media that were detected at concentrations greater than maximum contaminant levels (MCLs) or EPA Region 10 risk-based concentrations (RBCs). The EPA Region 10 RBCs are provided as an example of acceptable EPA risk-based concentrations. The Region 10 RBCs were

calculated using default exposure values to evaluate the residential ingestion of soil or water. The contaminants listed below should be evaluated further in the risk assessment.

TABLE	MAXIMUM DETECTED CONCENTRATION	MCL	REGION 10 RBC
Table 1 (µg/L)			
1,2-dichlorobenzene	4,000	600	500
1,4-dichlorobenzene	4,100	75	2,000
arsenic	33	50	0.05 (carcinogenic)
beryllium	115	4	0.02 (carcinogenic)
nickel	1,310	100	700
Table 3 (mg/kg)			
hexachlorobenzene	810	NA	0.4 (carcinogenic)
Table 4 (mg/kg)			
beryllium	3.7	NA	0.1 (carcinogenic)
Table 6 (µg/L)			
arsenic	12.2	50	0.05 (carcinogenic)

21. Appendix K4, Adult Fish and Game Ingestion, Reasonable Maximum Exposure. The chronic hazard index ingestion intake factor is listed as 7.02×10^{-5}. The correct value should be 7.6×10^{-5}.

22. Section 6.9.2.2, Page 6-65, Paragraph 1. The text states that benthic study analyses for the selected list of target analyte list (TAL) metals was performed on lake sediments in the Hatchetigbee Lake. The rational for excluding analyses for organic constituents, especially HCB and DDT, should be provided.

23. Section 6.9.2.5, Page 6-71, Paragraph 3. The text states that the presence or absence and relative abundance of vegetation, benthic macroinvertebrates, fish, and higher vertebrates

are indicators of stress or perturbation. Though this is generally true, the study does not indicate that any identified stress or perturbations are related to site contaminants. Therefore, these may not be appropriate assessment endpoints, especially without adequate reference data. The text should explain why the reference data was deemed appropriate for assessing the vegetative and benthic communities. In addition, justification should be provided for omitting fish and higher vertebrates from the assessment.

24. Section 6.9.3.1, Page 6-76, Paragraph 5. The text states that the most plausible explanation for the mortality rate of the younger cypress trees in the basin is related to localized physical disruption of the soil and/or hydrology. The term "localized physical disruption" should be defined and a discussion provided as to why this conclusion was reached (i.e. visual observation, personal interviews, etc.).

25. Section 6.9.3.1, Page 6-77, Paragraph 2. The text states that several dead oak trees were observed in OU-2, yet no explanation of the probable cause of death is provided. Possible explanations for the mortality of the trees should be provided.

26. Section 6.9.3.2, Page 6-78, Paragraph 2. The text states that statistical analyses were not performed using the HCB data because of the "high incidence of nondetects"; however, nine of the twenty-two sampling stations had quantifiable concentrations of HCB. Provide further justification for not performing statistical analyses of the HCB data.

27. Section 6.9.3.2, Page 6-80, Paragraph 5. The text describes several species of macroinvertebrates that are generally considered pollutant sensitive or are indicative of polluted environments. References for these assertions should be provided.

Also, results of the macroinvertebrate sampling indicate these pollutant-sensitive species to be present in low numbers or completely absent. However, the last sentence in this paragraph states that definite conclusions cannot be made regarding the relationship between these taxa and chemical concentrations in the sediments. Although the purpose of the study was to determine the effects of site contaminants on the benthic community, measures of the population and diversity of the benthic community have been inconclusive.

28. **Section 6.9.3.2, Page 6-81, Paragraph 2**. The text states that the basin sampling data showed no consistent patterns of the occurrence of oligochaetes having aberrant chaetae. However, it is also stated that the largest percentages of aberrations generally occurred in the eastern portion of the basin, where higher mercury concentrations in sediments occurred. These statements are contradictory and should be explained.

The text also states that published literature shows a relationship between aberrant chaetae and heavy metal concentrations, but then concludes that no evidence exists to indicate whether these aberrations affect the health of the individuals. Therefore, it is unclear why this data was collected and analyzed if no impacts to the benthic community could be demonstrated. An explanation as to the benefit of this data should be provided.

29. **Section 6.9.3.2, Page 6-81, Paragraph 3**. The text states that the data indicate a relationship between mercury concentrations and the benthos, but distinct statistical relationships were not identified. An explanation for this discrepancy should be provided.

30. **Section 6.9.3.3, Page 6-85, Paragraph 3.** The text should provide an explanation as to why fish sampling was not conducted and condition factors were not obtained from Hatchetigbee Lake, which was used as the reference area.

31. **Section 6.9.5, Page 6-94, Paragraph 2**. The text presents a conceptual exposure model of the site; however, the primary and secondary sources, release mechanisms, and receptor exposure routes were not included. These should be included to make the model more complete.

32. **Section 6.9.6.1, Pages 106 - 108**. The text provides mimimal information on the effects of mercury on the aquatic benthic community. If specific effects on community structure (diversity, mortality, etc.) and individuals (chaetae aberrations and other abnormalities) cannot be qualified, then these effects cannot be measured with confidence. Available information concerning the effects of mercury to the benthos should be included. Also, this issue applies to HCB and DDT and its metabolites (DDD, DDE) as discusssed in Sections 6.9.6.2 and 6.9.6.3, respectively.

33. **Section 6.0, Table 6-30**. The correct spellings of the following plants should be provided: *Hibiscus moscheuto*, *Quercus phellos*, and American Holly. The common name of *Spirodela polyrhize* should be corrected to "great duckweed".

34. **Appendix L3** The purpose of this appendix is to present lists of flora and fauna known or expected to exist in OU-2; however, the list of flora has been omitted. This information should be included.

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1. Brady, N.C., 1974. The Nature and Properties of Soils. 8th Edition. New York MacMillan Publishing Company, Inc.

2. U.S. Environmental Protection Agency (EPA), 1992a, Memorandum Issuing New Interim Region IV Risk Assessment Guidance (February 11).

2. U.S. EPA, 1992b, Dermal Exposure Assessment: Principle and Applications, EPA 600/8-91/011B, Office of Emergency and Remedial Response (March).

3. U.S. EPA, 1992c, Integrated Risk Information System, Access date: March 1993, U.S. Department of Health and Human Services, National Library of Medicine Toxicology Data Network (TOXNET), Bethesda, MD.

4. U.S. EPA, 1992d, Health Effects Assessment Summary Tables, FY-1992 Annual. Office of Emergency and Remedial Response (March).

5. U.S. EPA, 1991a, Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual. U.S. EPA Region IV Environmental Services Division, Athens, Georgia (February 1).

6. U.S. EPA, 1991b, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B), OSWER Directive 9285.7-01B (December).

7. U.S. EPA, 1990, Administrative Order By Consent for Remedial Investigation and Feasibility Study, EPA Docket No. 90-13-C (May).

8. U.S. EPA, 1989, Risk Assessment Guidance for Superfund Volume II: Environmental Evaluation Manual, Office of Emergency and Remedial Response, EPA/540/1-89/001 (March).

9. U.S. EPA, 1989, Exposure Factors Handbook, Office of Health and Environmental Assessment, EPA/600/8-89/043 (May).

10. U.S. EPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Remedial and Emergency Response, OSWER Directive 9355.2-01, EPA/540/G-89/004 (October).

11. Woodward-Clyde Consultants, Inc., 1992a, Preliminary Site Characterization Summary, McIntosh Plant Site, Olin Corporation, McIntosh, Alabama (April).

12. Woodward-Clyde Consultants, Inc., 1992b, Phase III Sampling and Analysis Plan, McIntosh Plant Site, Olin Corporation, McIntosh, Alabama (June).